

**DIVISION 900**

**INCIDENTAL  
CONSTRUCTION**

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### **901.00 FIELD LABORATORIES AND SCALE HOUSES**

#### **901.01 GENERAL REQUIREMENTS**

The Project Manager shall determine if the field laboratories or scale houses furnished by the contractor conform to the requirements of the specifications, supplemental specifications and/or the special provisions. Inspection report forms for the laboratories are available at the district offices.

The Project Manager shall require the contractor to furnish, relocate when necessary and maintain the field laboratory or scale house as specified.

The personnel using the contractor furnished facility shall use due care in performing their required duties to prevent unnecessary wear and tear on the facility.

#### **901.02 METHOD OF MEASUREMENT**

Appendix 3 of this manual has an example of the field book records required for a field laboratory.

#### **901.03 BASIS OF PAYMENT**

Payment of 100 percent will be made for the field laboratory after it is inspected and approved by the Project Manager. When two or more projects are included in the same contract the cost for the field laboratories may be prorated to the projects on the contractor's estimate forms furnished the Project Manager. When preparing the form for submittal, the Project Manager will use the same decimal quantities, shown under contract quantities on the form, for each project on the first estimate that payment is made for this item even though work has started on only one of the projects involved. Payment for the field laboratory will not be related to the percent of work performed by the contractor.

**902.00 GUARDRAIL CHECKLIST**

		YES	NO
@	1. Before construction of the guardrail, is the slope from the shoulder line 2 ft. (600 mm) past the guardrail post 10:1 or flatter?	_____	_____
	2. Are offsets correct? [ $\pm 1"$ (25mm)].	_____	_____
	3. Is rail height above ground, 27 to 27.5 inches (686 to 702 mm) is OK, but 27 $\frac{3}{4}"$ to 30" (702 to 762 mm) preferred for W-beam; 32 $\frac{1}{2}"$ inches (810 mm) for thrie-beam including the bull-nose; cable is at 30 inches.	_____	_____
	4. Is rail alignment good?	_____	_____
	5. Are laps to specified case in direction of traffic?	_____	_____
@	6. Is post spacing correct?	_____	_____
	7. Are plate washers on post bolts according to plans?	_____	_____
	8. Is 8x8 inches (200 mm x 200 mm) plate washer installed correctly (nails)?	_____	_____
	9. Are washers in correct location on all connections?	_____	_____
	10. Is surfacing/pavement around timber guardrail posts removed and backfilled properly [7" (180 mm) behind post.]?	_____	_____
@	11. Are high strength bolts used in bridge end connection? (See 903.03)	_____	_____
	12. Are object markers and new hardware in correct location?	_____	_____
	13. Are delineators in correct locations?	_____	_____
	14. If 6x8 inch (150 mm x 200 mm) posts are used, are they installed properly?	_____	_____
	15. Is end anchorage cable tightened? (Remove all slack)	_____	_____
	16. Are the vertical steel tubes at the correct elevation [less than 4" (100 mm) above soil]?	_____	_____
	17. Are the horizontal steel struts between the end post and the 2 <sup>nd</sup> posts resting on the ground?	_____	_____
	18. Is the horizontal steel strut below the hole in the wood post?	_____	_____
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**903.00 W-BEAM/THRIE-BEAM GUARDRAIL**

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**903.01 DESCRIPTION**

The construction inspection for this work includes:

1. Checking the plan information with actual field conditions to assure plan information is correct or to modify it as necessary to more closely fit field conditions.
2. Preparing a field checked order list for the contractor's use in ordering the necessary materials. This order list should be prepared in letter form to the contractor and include the following listed items.
  - a. List stations of guardrail.
  - b. Side of project.
  - c. Build, remove, reset, etc.
  - d. Linear **feet** (meters) of rail.
  - e. Type of rail.
  - f. Type of end **treatment**.
  - g. Number, type and dimensions for special posts.
  - h. Special and/or standard plan numbers.

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This field checked order list should be prepared and submitted to the district office for their review. The district office will distribute the original and copies of the order list after they have reviewed it.

3. This field checked order list should be prepared and submitted as soon as possible to allow the contractor ample time to obtain the necessary materials prior to the date established for beginning the work.
4. All build items will be staked by the field personnel. Stakes will be set at the ends of guard rail locations. Nails (red heads with wire flags as guards) should be set at each post location. The location of **end treatments**, bridge approach sections, etc. should be marked with stakes.
5. The field book record for this work should include:
  - a. Plan data.
  - b. Construction data.
  - c. Staking information.
  - d. Inspection information.

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e. Quantities and summary of quantities.

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f. End treatment.

6. Usually guardrail contract work cannot be started until other contract work on the project is completed. Therefore, the Project Manager must keep the district office, the contractor and the construction office informed as to the date the work site will become available.

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7. The Contractor must submit to the Construction Division shop plans on the type of "end treatment" that will be installed. Approved shop plans will be distributed to Maintenance so that future repair work has good reference documents. The PM must indicate on the "As-Built" Plans the types of "end treatments" that were installed.

## GENERAL INSTRUCTIONS

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Safety implications make it very important that the Project Manager, inspector, and contractor know the plans and specifications that apply to this work.

A guardrail inspection checklist is provided at the beginning of this Division. This checklist may be helpful in preparation and inspection for guardrail work. Inspection and material acceptance requirements are identified in the Plans and Specifications.

Guardrail installations are dependent on correct location of shoulder or bridge approach paving and 10:1 (or flatter) approach slope to guardrail. Prior to the start of guardrail installations, these need to be reviewed and verified.

@

Slope on finished surface between shoulder and a point at least 2 feet (600 mm) behind back of posts should be 10:1 or flatter. This provides a slope which will keep vehicle wheels in contact with the ground and adequate soil support for the posts.

If the inspector or the Project Manager observe a variance from plans or specifications, then the contractor should be advised immediately. When situations arise that are not covered by specifications, plans, standard plans, or this instruction, contact the Construction Division.

### 903.02 MATERIAL REQUIREMENTS

The plans, special provisions and specifications will include the material requirements. The Materials and Research Manual includes the inspection and test requirements for the materials. The field personnel must insure that all materials used in the work conform to these requirements.

### 903.03 CONSTRUCTION METHODS

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Standard plan for Traffic Control Devices for Construction and Maintenance, is a part of all guardrail project plans. Field personnel shall insure that project traffic (whether local only or traffic maintained condition are in effect) is controlled and workmen protected so this work is performed under safe conditions for all involved. Generally, guardrail work would be considered to require traffic control procedures similar to the situation sketches for minor maintenance of short duration or road repair.

- @ The specifications are very detailed on construction methods and the field personnel must insure that these methods are used. All connections must be tightened, etc. Cables that are anchored in concrete cannot be tightened until the concrete has attained **2000 psi (14 Mpa)**. The work is not complete until the contractor has tightened all turnbuckles, **cables, nuts**, etc.

## **W-BEAM AND THRIE-BEAM GUARDRAIL INSTALLATION**

### **Rail Alignment**

Rail shall be installed with reasonably smooth vertical and horizontal lines. Kinks in both straight and shop curved sections shall be avoided. Face of rail shall have no protrusions that could catch a vehicle sliding along the rail. The project plans will show how to install the guardrail. Minor adjustments may be made to meet plan requirements.

### **Guardrail Posts**

- @ Posts shall be installed at prepunched holes and at intervals shown on the correct plan. Post details on the plans show required backfill materials and correct hole sizes.

Where longitudinal obstructions (electric cables, curbs, etc.) are encountered, 2 or 3 posts may have a maximum of 2 blockouts to provide an offset. If this cannot be done, obstruction shall be removed or relocated. We could also use a 25 ft (7.62 m) section of **nested guardrail** over one or two posts and avoid using post in obstructed locations. Plans will show **these** details.

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### **Rail Section Location**

- @ All prepunched rail sections should be in proper location within each guardrail assembly. This involves sections with **3 feet-1½ inch** post spacing, sections with **6 feet- 3 inch (1.905 m)** post spacing, and appropriate **end treatments** section as shown in the plans.

### **Rail Height**

- @ Guardrail installations are constructed with W beam and thrie-beam rail. The Standard Plans indicate the mounting height is measured from surface of ground at the face of rail to the top of rail. Target height is **27 ¾ (705 mm)** for W-beam and **32? inch (829 mm)** for thrie-beam.

On a project where all new guardrail is installed or existing guardrail is being removed and reinstalled, tolerance will be.

## Lapping of Guardrail

Lapping of rail must be accomplished in a uniform manner. Details shown in the plans will achieve uniformity statewide. However, clarification may be helpful in obtaining this uniformity in specific instances.

@ Plans indicate guardrail shall normally be lapped in direction of traffic flow. Following this general rule, most installations will be lapped correctly. Plans provide a lapping procedure detail for each type of guardrail installation except:

- Where guardrail alignment is curved away from centerline (bridge ends or end sections), lap should protect approach vehicles.

Keep in mind that the basic principle of lapping has to do with favoring the traffic for which the guardrail is being installed.

@ All laps of rail shall take place at a post. The 5/8 inch (16 mm) x 1 ¼ inch (32 mm) splice bolts at these laps should not have washers.

## BRIDGE CONNECTIONS

@ All end treatments including bridge approach sections shall be installed so that the end post sleeve is not more than 4 inches above ground level so that the undercarriage of a vehicle cannot be snagged. Exception to this is on trailing end of a one-way bridge where Type "J" terminal section shall be installed on outside of rail.

On guardrail attachments to concrete which require a bolt longer than 2 ft (600 mm), 7/8 inch (22 mm) bolt anchors may be grouted into concrete using threaded insert anchors with epoxy.

All bolts on bridge end connections shall be high strength, galvanized hex bolts. Surface of bolt head should be marked A-325, A449 or have three radial marks at 120° intervals.

## GUARDRAIL POST

@ W-beam and thrie beam guardrail posts – wood and steel – must be able to rotate if the beam rail is to work properly. Care must be taken to insure compliance with the details shown on the plans regarding “space” and density of material behind the posts.

## END TREATMENTS

@ There are two general types of end treatments (Type I & II). Future plans will no longer provide “end treatment” details. Contractors will be required to submit shop plans for the “end treatment” they want to use. The plans will indicate where the end treatment is to be installed and whether Type I or Type II end treatment is required and also the acceptable styles for each “Type” (such as Best, ET-2000, etc).

End treatment Type I is dimensioned as 50 feet (15.2 m) so that ET-2000, Best and SKT-350 can be bid competitively. The ET-2000 is only 37 feet- 6 inches (11.4 m) and the extra

- @ 12 feet-6 inches (3.8 m) split will be standard W-beam, either placed parallel or 25:1 as shown on the guardrail layout special plan.

End treatment Type I is generally used on expressways and interstates where the speed limit will be at or above 65 mph. “Type I” will be on a guardrail which is set on a 25:1 taper.

End treatment and Type II is used at locations where the posted speed is under 65 mph. Type II will be on guardrail which is on a 15:1 taper.

The PM must indicate the type of end treatment that was installed in the “As-Builts”.

## **END ANCHORAGE**

- @ To insure that concrete does not become attached to bottom and sides of breakaway end anchorage post a small amount [1 or 2 inch (25 or 50 mm)] of soil may be tamped around post bottom or bottom 6 inches (150 mm) of post may be wrapped with expanded polystyrene foam sheets in place as shown on the plans. If steel tubes are used, grease the bottom 12 inches (300 mm) of the wood post and the inside of the sleeve generously. This is done so that it would be easy to remove the damaged ones.

Soil removed from all end anchorage holes should be disposed of away from the hole to insure proper installation height.

To remove post a small quantity of diesel fuel can be poured on expanded polystyrene foam. This will dissolve foam for easy removal.

## **903.04 METHOD OF MEASUREMENT**

Final field measurement will not be required when the guardrail is constructed as ordered.



## **904.00 SUBDRAIN EARTHWORK**

### **904.01 SUBDRAINS**

Subdrains are constructed on grading, paving, and structures contracts. Refer to *SSHC Sections 914 and 915*.

Subdrains are used for tile relocations, backslope drains, longitudinal and cross drains under the roadway area.

Subdrains are also used with granular blankets to develop a drainage layer in areas where the soil has a high moisture content and poor stability.

### **904.02 BACKSLOPE DRAINS**

Backslope drains are used in areas where seepage and/or a slide is possible. Where a water table is perched on a very dense layer, a subdrain is installed at or below the surface of the very dense layer. The flow line is very important in this case. A backslope drain may also be used to drain a sand pocket, again plan flow line is important.

### **904.03 LONGITUDINAL DRAINS**

Longitudinal drains are usually installed at the pavement edge to remove any water that accumulates under the pavement.

Inspection considerations must include:

- **Trench Excavation**

The trenching equipment must be adjusted and maintained so the trench is excavated to the specified depth. It is important that all of the loose excavated material is removed from the bottom of the trench to minimize settlement of the trench backfill. Trenchers have a metal device on the end of the trencher's boom called a "cumber." The "cumber" is to be adjusted so the loose material is scraped off of the bottom and removed.

- **Outlets**

All outlets should be inspected prior to backfilling. The pipe coupling should be inspected to assure proper installation. The flow line of the outlet should be checked for uniform downward grade toward the ditch. All outlets are to be marked with an orange fence post.

Some projects require that existing subdrain outlets be extended, for example, on a shoulder widening project. On these projects, the contractor must remove the existing rodent guard before extending the pipe.

### **Porous Backfill**

Porous backfill material must be in contact with the base of the pavement for the subdrain system to operate correctly. This may require hand work by the contractor. No soil shall remain between the pavement edge and the subdrain trench.

## CHAPTER NOTES:

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